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IRAN: NUTRITION SURVEY OF THE ARMED FORCES

Supplement No. 1 - THE KHASH SURVEY

By
The Iran Nutrition Survey Team

Interdepartmental Committee on
Nutrition for National Defense

December 1956

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ASSISTANT SECRETARY OF DEFENSE

Washington 25, D. C.

Health and Medical

February 11, 1957

On behalf of the Interdepartmental Committee on Nutrition for National Defense, it is my pleasure to transmit Supplement No. 1 - The Khash Survey, Iran: Nutrition Survey of the Armed Forces. We wish to compliment the Iranian Nutrition Survey Team on the excellent manner in which they conducted the survey in the Khash area, the thoroughness of the study and the practical recommendations proposed.

The Committee has a lasting interest in nutrition and health in Iran and is impressed with the programs initiated to improve the feeding and nutrition of the Iranian Armed Forces. We shall welcome requests for tabulation of survey findings and consultative advice at any time.

Frank B. Berry

Frank B. Berry, M. D.
Chairman

Iran Nutrition Survey Team

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IRAN: NUTRITION SURVEY OF THE ARMED FORCES

Supplement No. 1 - THE KHASH SURVEY

Reference - Iran: Nutrition Survey of the Armed Forces by the Interdepartmental Committee on Nutrition for National Defense, August 1956.

Mission

The Nutrition Survey of the Armed Forces conducted by the joint U.S. - Iran Nutrition Survey Team, 23 January - 12 April 1956, included plans to survey troops in the Khash area. Inclement weather, however, made it necessary to defer the Khash survey until late April 1956. Therefore, the Iranian Nutrition Survey Team made the survey in Khash, after the American team members had departed for home, and forwarded the data and findings to the Interdepartmental Committee on Nutrition for National Defense for tabulation and comparison with data from other survey areas in Iran.

The Iranian team is to be highly commended for making the Khash survey and for their analysis of the problems encountered.

Summary

More nutritional problems were observed among troops in the Khash area than in any of the other areas surveyed. These problems involve insufficient calories, scarcity of fruits and vegetables, and lack of processed foods. Based on physical examination data and biochemical findings, the nutritional status of the troops was borderline in riboflavin, vitamin A or carotene, and vitamin C. In Khash, the troops weighed considerably less in relation to height and age than in other areas surveyed. The majority of troops listed as being in the service for less than six months were new recruits inducted only a few days prior to the survey. These inductees showed more physical signs of borderline nutrition than those who had served for over two years.

Recommendations

The general recommendations in the initial report (Iran: Nutrition Survey of the Armed Forces, August 1956), also apply to the Khash area. The Iranian survey team made the following recommendations with which the Interdepartmental Committee on Nutrition for National Defense concurs:

1. That the monthly ration allowance per man in the Khash area be increased from 447.2 rials to approximately the 540 rials allowed in other areas.
2. That efforts be made to increase the meat supply to the troops (now approximately 550 grams per man per day compared with 800 to 1,370 grams in other areas), by raising sheep on the good pastures around Taftan Mountain.
3. That the troops of the Khash area be given priority in the allocation of processed perishables particularly to supplement the ration for units in outlying areas.
4. That vegetable oil (margarine) be enriched with 15,000 International Units of vitamin A per pound. Based on the rate of issue of approximately 30 grams of vegetable oil per man per day to troops in the other areas surveyed, the proposed enrichment would supply approximately 1000 International Units of vitamin A per man per day.

In addition to the above recommendations, the Committee suggests that special consideration be given to:

1. Studying the effectiveness of margarine enriched with 15,000 International Units of vitamin A per pound, in alleviating those clinical symptoms which are attributed to a deficient dietary intake of vitamin A. The possibility of extending this enrichment program to other areas should then be considered.
2. Additional food sources of vitamin C as well as vitamin A or carotene should be supplied to the troops in this area. A minimum daily amount (60 grams per man), of deep green and dark yellow vegetables should be provided.
3. That consideration be given to a periodic rotation of troops to and from the Khash area.

Organization and Methods

The organization of the team was similar to that of the group that surveyed the other areas, except that the Khash survey was conducted exclusively by the Iranian team. The methods were the same as described in the initial survey report. Troop units to be examined were chosen by lot and every fourth man had specimens of blood and urine taken for analysis.

Findings

1. Location, Population and Agriculture:

Khash is 1746 kilometers southeast of Tehran in the Baluchistan Desert area and is situated at the foot of Taftan Mountain, an old volcano from which sulphur gases are blown over the countryside. The population of Khash, other than military personnel and their dependents, is about 2,000. Owing to dry weather, lack of water and other factors, agricultural production is insufficient for local requirements. Dry winds frequently blow tons of sand over the city. There is some pasture about eight kilometers from town where more sheep could graze. Drinking water for the troops in Khash comes from a well which is reported to be unsuitable for drinking purposes. An American-type filter is used to purify the water; however, its capacity is limited. Water may be obtained by digging only two or three meters but it contains considerable sulphur, sodium chloride and other salts.

2. Dietary Intake and Food Service:

Several battalions are spread over a vast area around Khash, far from Brigade Headquarters or from any village. These troops receive a monetary allowance with which to buy perishable foods. The monthly allowance for rations in this area is 447.20 rials per man, while in other areas it is 540 rials. The cost of living, however, is higher around Khash owing to inadequate local production in this arid region and the costs involved in bringing in food from distant areas. The weekly meat allowance for each soldier is 550 grams compared with 800 grams in Mashad, 1065 grams in Tabriz, 1240 grams in Mahabad and 1370 grams in Tehran. Data on the exact amount of each food consumed per man per day are not yet available. In general, efforts are made to follow the prescribed master menu as outlined in Table 1 of the initial survey report. Troop movements are limited by lack of portable kitchens. A field bakery

set was made by Major Afrakhteh and given to the brigade. The brigade commanding officer recommended that similar sets be constructed for the border units.

3. Physical:

The troops in the Khash area weighed, on the average, considerably less for their age and height than troops in any of the other areas surveyed. Forty-five and five-tenths percent of the troops were less than ninety percent "standard weight" and ten and one-tenth percent were less than eighty percent; whereas in the other areas only seventeen and four-tenths percent of the troops were under ninety percent "standard weight" and only two and two-tenths percent were under eighty percent. The new recruits were thin but increased in body weight during the first year of service. However, those in service for over two years were similar in weight to the new recruits. The trainees were thinner than those in the medical or infantry units (Table 1).

Physical signs indicative of a riboflavin deficiency were observed among the troops as follows: Eleven and one-tenth percent had angular lesions of the mouth, sixteen and five-tenths percent had cheilosis, and nine and eight-tenths percent nasolabial seborrhea. Vitamin A deficiency was indicated by follicular keratosis in forty-six and one-tenth percent and xerosis in nine and eight-tenths percent. Bleeding gums appeared in sixteen and eight-tenths percent and scorbutic-type gums in three percent of the troops. This is suggestive of low intakes of vitamin C. There was no evidence of deficiencies in niacin, thiamine or protein. Those in the service for over two years generally were better in appearance and showed fewer signs of borderline nutrition (Table 3). The incidence of cheilosis and scorbutic-type gums decreased markedly after eating Army food for six months; although the incidence of angular lesions of the mouth, follicular keratosis and nasolabial seborrhea apparently did not decrease until after two years of living on Army food. Cold, bluish extremities occurred in only eight and eight-tenths percent of the troops in this southeastern part of the country.

4. Biochemical Survey:

The results of plasma protein, hemoglobin and hematocrit determinations (Table 4) indicate that protein intake was sufficient and no severe anemia problem exists. Plasma vitamin C (Table 5) was extremely low in 94 percent of troops, i.e., less than 0.1 mg. per 100 ml. plasma. Eighteen percent of the troops had low plasma vitamin A levels (10 mcg. per 100 ml. plasma), and an additional fifty percent had only marginal levels (11 to 19 mcg. per 100 ml.); plasma carotene was low (19 mcg. carotene per 100 ml. plasma) in forty-nine percent of the troops, with an additional forty-seven percent having marginal levels (20-39 mcg. per 100 ml. plasma) (Table 5). Marginal levels of urinary thiamine excretion (less than 25 mcg. per 6 hours) occurred in only four percent of the troops (Table 6), while the remainder had very adequate levels. All the troops had very good levels of N'Methylnicotinamide excretion (Table 6), whereas approximately twenty-three percent had low to marginal levels (less than 30 mcg. per 6 hours) of riboflavin excretion.

Significance of Findings

Calorically the recruits are more undernourished upon induction than troops who have had a few months' service. However, those troops who have served in this area for over two years are similar to the new recruits in percent of standard weight. The apparent cause for this shift in body weight as related to time in service is not known, and should be further investigated. The Khash area troops are getting less food than troops in other areas. A number of their units are spread over a vast area far from brigade headquarters and villages, making the provision of food a difficult problem.

The low plasma levels of vitamin A, carotene, and vitamin C as well as physical lesions, point to the lack of fresh fruits and yellow-green vegetables. The shortage of these foods is greater around Khash than in other areas. Riboflavin intakes were also low as evidenced by the high incidence of cheilosis and the large number of men with low urinary riboflavin excretion.

A comparison of the physical and biochemical findings of the Khash troops with those of other areas is given in Table 7. These findings indicate the need for special action in improving the ration for the troops in the Khash area.

TABLE 1

Khash, Iran: Percent of "Standard Weight"*
By Time in Service

| | 60-69% | 70-79% | 80-89% | 90-99% | 100-109% | 110-119% | No. Exam. |
|---------------------|--------|--------|--------|--------|----------|----------|-----------|
| 0 - 5 Months | 1.8 | 14.5 | 49.1 | 27.3 | 7.3 | 0 | 55 |
| 6 - 11 Months | 0 | 1.7 | 28.8 | 50.8 | 18.6 | 0 | 59 |
| 1 - 2 Years | 0 | 6.0 | 31.6 | 52.6 | 9.8 | 0 | 133 |
| 2 + Years | 2.0 | 22.0 | 38.0 | 24.0 | 10.0 | 4.0 | 50 |
| TOTALS | 0.7 | 9.4 | 35.4 | 42.8 | 11.1 | 0.7 | 297 |
| By Type of Activity | | | | | | | |
| Inf. + Armored | 0.5 | 7.8 | 30.9 | 47.0 | 12.9 | 0.9 | 217 |
| Inf. Training | 1.8 | 16.4 | 47.3 | 29.1 | 5.5 | 0 | 55 |
| Med. Clearance | 0 | 8.0 | 48.0 | 36.0 | 8.0 | 0 | 25 |
| TOTALS | 0.7 | 9.4 | 35.4 | 42.8 | 11.1 | 0.7 | 297 |

*Based upon U.S. Age-Height-Weight Averages (Davenport Tables).

TABLE 2

Khash, Iran: Clinical Summary by Unit

| | Infantry Anti-Tank and Mortar | Infantry Training | Medical Clearance | Total |
|------------------------------|--|----------------------|----------------------|-------|
| Number of Troops Examined | 217 | 55 | 25 | 297 |
| PERCENT OF TROOPS | | | | |
| <u>APPEARANCE</u> | | | | |
| Good | 25.8 | 10.9 | 20.0 | 22.6 |
| Fair | 55.3 | 30.9 | 48.0 | 50.2 |
| Poor | 18.9 | 58.2 | 32.0 | 27.3 |
| Cachexic | 0 | 0 | 0 | 0 |
| <u>SKIN</u> | | | | |
| Nasolabial Seborrhea | 9.7 | 9.1 | 12.0 | 9.8 |
| Follicular Keratosis | 48.4 | 38.2 | 44.0 | 46.1 |
| Bluish Cold Extrem. | 6.5 | 21.8 | 0 | 8.8 |
| Xerosis | 9.2 | 14.5 | 4.0 | 9.8 |
| Crackled Skin | 0 | 0 | 0 | 0 |
| <u>EYES</u> | | | | |
| Thickened Conjunctiva | 21.2 | 27.3 | 44.0 | 24.3 |
| Conjunctival Injection | 19.8 | 14.5 | 36.0 | 23.2 |
| Blepharitis | 3.2 | 1.8 | 0 | 2.7 |
| <u>MOUTH</u> | | | | |
| Angular Lesions | 13.8 | 3.6 | 4.0 | 11.1 |
| Angular Scars | 29.0 | 32.7 | 24.0 | 29.3 |
| Ang. Scars and Lesions | 0 | 0 | 4.0 | 0.3 |
| <u>LIPS</u> | | | | |
| Cheilosis | 14.7 | 23.6 | 16.0 | 16.5 |

TABLE 2 (Cont'd)

| | Infantry Anti-Tank and Mortar | Infantry Training | Medical Clearance | Total |
|---|--|----------------------|----------------------|-------|
| Number of Troops Examined | 217 | 55 | 25 | 297 |
| PERCENT OF TROOPS | | | | |
| <u>TONGUE</u> | | | | |
| Filiform Atrophy (slight not included) | 6.5 | 1.8 | 0 | 5.0 |
| Fungiform Atrophy | 18.9 | 10.9 | 24.0 | 17.8 |
| Papillary Hypertrophy | 8.3 | 5.5 | 16.0 | 8.4 |
| Geographic Tongue | 4.6 | 5.5 | 0 | 4.4 |
| Fissures and Furrows | 2.8 | 1.8 | 4.0 | 2.7 |
| <u>TEETH</u> | | | | |
| Caries | 18.9 | 32.7 | 24.0 | 21.9 |
| Worn Teeth | 50.2 | 27.3 | 48.0 | 45.8 |
| Fluorosis | 1.4 | 5.5 | 8.0 | 2.7 |
| <u>GUMS</u> | | | | |
| Recession | 41.9 | 32.7 | 52.0 | 41.1 |
| Bleeding | 17.1 | 14.5 | 20.0 | 16.8 |
| Scorbutic Type | 2.3 | 5.5 | 4.0 | 3.0 |
| Marginal Redness | 20.3 | 16.4 | 40.0 | 21.2 |
| Marginal Swelling | 23.0 | 20.0 | 36.0 | 23.6 |
| Atrophy of Papillae | 3.2 | 10.9 | 4.0 | 4.7 |
| <u>OTHER</u> | | | | |
| Splenomegaly | 0 | 0 | 0 | 0 |
| Edema of Legs | 0 | 1.8 | 0 | 0.3 |
| Loss of Ankle Jerk | 0.9 | 1.8 | 0 | 1.0 |

TABLE 3

Khash, Iran: Clinical Summary by Time in Service

| | 0 - 5 Months | 6 - 11 Months | 1 - 2 Years | Over 2 Years |
|-------------------------|-----------------|------------------|----------------|-----------------|
| Number Examined | 55 | 59 | 133 | 50 |
| PERCENT OF TROOPS | | | | |
| <u>APPEARANCE</u> | | | | |
| Good | 9.1 | 27.1 | 20.3 | 38.0 |
| Fair | 34.5 | 52.5 | 57.9 | 44.0 |
| Poor | 56.4 | 20.3 | 21.8 | 18.0 |
| Cachexic | 0 | 0 | 0 | 0 |
| <u>SKIN</u> | | | | |
| Nasolabial Seborrhea | 10.9 | 6.8 | 12.8 | 4.0 |
| Follicular Keratosis | 47.3 | 55.9 | 54.9 | 10.0 |
| Bluish Cold Extremities | 21.8 | 3.4 | 8.3 | 2.0 |
| <u>MOUTH</u> | | | | |
| Angular Lesions | 5.5 | 8.5 | 17.3 | 4.0 |
| Angular Scars | 30.9 | 33.9 | 29.3 | 22.0 |
| <u>TONGUE</u> | | | | |
| Fissures and Furrows | 1.8 | 5.1 | 0.8 | 6.0 |
| <u>GUMS</u> | | | | |
| Bleeding | 14.5 | 16.9 | 23.3 | 2.0 |
| Scorbutic Type | 5.5 | 1.7 | 3.8 | 0 |
| Marginal Redness | 20.0 | 18.6 | 27.8 | 8.0 |
| Marginal Swelling | 21.8 | 25.4 | 27.8 | 12.0 |
| <u>LIPS</u> | | | | |
| Cheilosis | 30.9 | 8.5 | 16.5 | 10.0 |

TABLE 4

Khash, Iran: Plasma Protein, Hemoglobin and Hematocrit

Plasma Protein gm/100 ml. Percent of the 71 Troops Examined

| | |
|---------------|------|
| 6.0 and under | 0 |
| 6.1 - 6.5 | 1.4 |
| 6.6 - 7.0 | 2.8 |
| 7.1 and over | 95.8 |

Hemoglobin gms/100 ml. Percent of the 71 Troops Examined

| | |
|----------------|------|
| 11.9 and under | 2.8 |
| 12.0 - 13.9 | 28.2 |
| 14.0 - 14.9 | 12.7 |
| 15.0 and over | 56.3 |

Hematocrit Percent Percent of the 73 Troops Examined

| | |
|--------------|------|
| 36 and under | 2.7 |
| 37 - 41 | 5.5 |
| 42 - 45 | 21.9 |
| 46 and over | 69.9 |

TABLE 5

Khash, Iran: Plasma Vitamin C, Vitamin A and Carotene

| By Time in Service | | | | By Type of Activity | | | | Khash Total |
|-----------------------------------|--------------|-------------|----------------|---------------------|----------------------|----------------------|------|----------------|
| 0-5 Mos. | 6-11 Mos. | 1-2 Yrs. | Over 2 Yrs. | Inf. and Armored | Infantry Training | Medical Clearance | | |
| Number of Troops | | | | | | | | |
| 14 | 17 | 25 | 11 | 49 | 11 | 7 | 67 | |
| <u>Plasma Ascorbic Acid mg. %</u> | | | | | | | | |
| 0.1 and under | | | | | | | | |
| 85.7 | 94.1 | 100.0 | 90.9 | 95.9 | 81.8 | 100.0 | 94.0 | |
| 0.11 - 0.19 | | | | | | | | |
| 7.1 | 5.9 | 0 | 9.1 | 4.1 | 9.1 | 0 | 4.5 | |
| 0.20 - 0.40 | | | | | | | | |
| 7.1 | 0 | 0 | 0 | 0 | 9.1 | 0 | 1.5 | |
| 0.41 and over | | | | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Number of Troops | | | | | | | | |
| 16 | 17 | 28 | 11 | 52 | 13 | 7 | 72 | |
| <u>Plasma Vitamin A mcg. %</u> | | | | | | | | |
| 10 and under | | | | | | | | |
| 6.3 | 23.5 | 21.4 | 18.2 | 19.2 | 15.4 | 14.3 | 18.1 | |
| 11 - 19 | | | | | | | | |
| 43.8 | 52.9 | 57.1 | 36.4 | 55.8 | 30.8 | 42.9 | 50.0 | |
| 20 - 49 | | | | | | | | |
| 50.0 | 23.5 | 21.4 | 45.5 | 25.0 | 53.8 | 42.9 | 31.9 | |
| 50 and over | | | | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| <u>Plasma Carotene mcg. %</u> | | | | | | | | |
| 19 and under | | | | | | | | |
| 50.0 | 58.8 | 50.0 | 27.3 | 48.1 | 30.8 | 85.7 | 48.6 | |
| 20 - 39 | | | | | | | | |
| 43.8 | 41.2 | 50.0 | 54.5 | 48.1 | 61.5 | 14.3 | 47.2 | |
| 40 - 99 | | | | | | | | |
| 6.3 | 0 | 0 | 18.2 | 3.8 | 7.7 | 0 | 4.2 | |
| 100 and over | | | | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

TABLE 6

Khash, Iran: Urinary Excretion of Thiamine, Riboflavin and N'Methylnicotinamide

| | By Time in Service | | | By Type of Activity | | | Khash Total |
|--|--------------------|--------------|----------------------------|---------------------------------|----------------------------------|--|----------------|
| | 0-5 Mos. | 6-11 Mos. | 1-2 Yrs. Over 2 Yrs. | Inf. and Armored Training | Infantry Medical Clearance | | |

Number of Troops

| | | | | | | | |
|----|----|----|----|----|----|---|----|
| 16 | 17 | 28 | 12 | 53 | 13 | 7 | 73 |
|----|----|----|----|----|----|---|----|

Percent of Troops

Thiamine mcg/6 hrs.

| | | | | | | | |
|-------------|-------|------|------|------|------|------|------|
| 9 and under | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 - 24 | 0 | 11.8 | 3.6 | 0 | 0 | 14.3 | 4.1 |
| 25 - 49 | 0 | 0 | 0 | 25.0 | 3.8 | 0 | 4.1 |
| 50 and over | 100.0 | 88.2 | 96.4 | 75.0 | 92.5 | 85.7 | 91.8 |

Percent of Troops

Riboflavin mcg/6 hrs.

| | | | | | | | |
|--------------|------|------|------|------|------|------|------|
| 9 and under | 6.3 | 0 | 3.6 | 0 | 1.9 | 0 | 2.7 |
| 10 - 29 | 6.3 | 17.6 | 28.6 | 25.0 | 18.9 | 71.4 | 20.5 |
| 30 - 99 | 62.5 | 52.9 | 53.6 | 41.7 | 56.6 | 14.3 | 53.4 |
| 100 and over | 25.0 | 29.4 | 14.3 | 33.3 | 22.6 | 14.3 | 23.3 |

Percent of Troops

N'Methylnicotinamide mg/6 hrs.

| | | | | | | | |
|----------------|-------|------|------|------|------|-------|------|
| 0.19 and under | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.20 - 0.59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.60 - 1.59 | 0 | 17.6 | 7.1 | 8.5 | 11.3 | 0 | 8.2 |
| 1.60 and over | 100.0 | 82.4 | 92.9 | 91.5 | 88.7 | 100.0 | 91.8 |

TABLE 7

Iran: Incidence of Clinical Signs of Borderline Nutrition
Among Troops in Khash Vs. Other Areas

| | Khash | Area Having the Lowest Incidence | Area Having the Highest Incidence | Average of the Other Five Areas ^{1/} |
|--|-------|--|---|---|
| <u>Percent of Troops</u> | | | | |
| Below 90% Std. Weight | 45.5 | 7.1 | 17.4 | 13.0 |
| <u>Low Riboflavin Intake Signs</u> | | | | |
| Angular Lesions | 11.1 | 7.5 | 19.0 | 14.6 |
| Angular Scars | 29.3 | 17.0 | 29.8 | 20.8 |
| Cheilosis | 16.5 | 1.3 | 6.5 | 3.4 |
| Nasolabial Seborrhea | 9.8 | 0.3 | 4.5 | 2.5 |
| Urinary B ₂ Excretion <30 mcg/6 hrs. | 23.2 | 4.5 | 30.7 | 21.3 |
| <u>Low Vitamin C Intake Signs</u> | | | | |
| Gums, Bleeding | 16.8 | 5.5 | 20.6 | 12.9 |
| Marginal Swelling | 23.6 | 5.1 | 38.5 | 21.9 |
| Scorbutic | 3.0 | 0 | 3.4 | 1.6 |
| Marginal Redness | 21.2 | 6.5 | 24.7 | 13.7 |
| Plasma Vitamin C <0.1 mg/100 ml. | 94.0 | 19.2 | 44.4 | 31.6 |
| <u>Low Vitamin A Intake Signs</u> | | | | |
| Follicular Keratosis | 46.1 | 21.4 | 49.5 | 29.8 |
| Xerosis | 9.8 | 0 | 0.3 | 0.1 |
| Plas. Vit. A <20 mcg/100 | 68.1 | 10.2 | 50.0 | 23.7 |
| Plas. Carotene <40 | 95.8 | 18.6 | 93.8 | 58.1 |

^{1/} Tehran, Ahwaz, Mahabad, Rasht, Mashad.